

Accuracy Characteristics for Final Delivery Scenario Hours 1200-1700 Single Site

1 Introduction

This document contains scenario characteristics for hours 1200 to 1700 GMT recorded on May 26, 1999 at Memphis ARTCC and cover either the ZME or ZID airspace. Characteristics to be provided are general statistics determined from the scenario on airspace characteristics, aircraft to aircraft and aircraft to airspace encounters, general air traffic, aircraft, flight plan adherence, interfacility traffic flow and deviations in weather forecasts. Definitions of the provided scenario characteristics are provided in Reference[1].

2 Reference

[1] Paglione,M., Oaks,R., Ryan,Dr. H., Summerill,J.S., (Final, January 2000), *Description of Accuracy Scenarios for the Acceptance Testing of the User Request Evaluation Tool (URET) / Core Capability Limited Deployment (CCLD)*, FAA William J. Hughes Technical Center / ACT-250, Atlantic City, New Jersey.

NOTE – Section numbers in this document do not map to those of the reference document.

3 Center Airspace

This section corresponds to Section 3.1 of Reference[1]. The below data corresponds to the ZME Center using the May 20, 1999 ACES chart cycle. Information gathered from running URET PRE, accessing the ZME Center Internet site and local knowledge.

Metric	Definitions	Count
Center Area	Approximate Square Miles	120000
Airports	From URET DU Adaptation List	778
Sectors	From URET DU Adaptation List	110
SAA	Special Activities Airspace	57
APDIA	Automated Problem Detection Inhibited Area	20
SID	Standard Instrument Departure	11
STAR	Standard Arrival Route	10
PAR	Preferential Arrival Route	594
PDR	Preferential Departure Route	346
PDAR	Preferential Departure Arrival Route	124

4 Aircraft Encounter Distributions

The statistics collected in this section characterize aircraft to aircraft encounters. The encounter counts are partitioned by selected minimum horizontal separation intervals, a count of encounters partitioned by standard flight levels, and by vertical phase of flight and aircraft encounter angle. This section corresponds to Section 3.2.1 in Reference[1].

4.1 Count Partitioned by Minimum Horizontal Separation

This section corresponds to Section 3.2.1.1 in Reference[1].

Table 1: Count of Current Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	13 Minutes Adherence
$0 \leq d < 5$	143	100
$5 \leq d < 10$	196	113
$10 \leq d < 15$	236	130
$15 \leq d < 23$	430	256
$23 \leq d < 30$	371	233
Total	1376	832

Table 2: Count of Trial Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
$0 \leq d < 5$	143	96
$5 \leq d < 10$	196	103
$10 \leq d < 15$	236	122
$15 \leq d < 24$	488	274
$24 \leq d < 30$	313	195
Total	1376	790

4.2 Count Partitioned by Altitude for Standard Separation Intervals

This section corresponds to Section 3.2.1.2 of Reference[1].

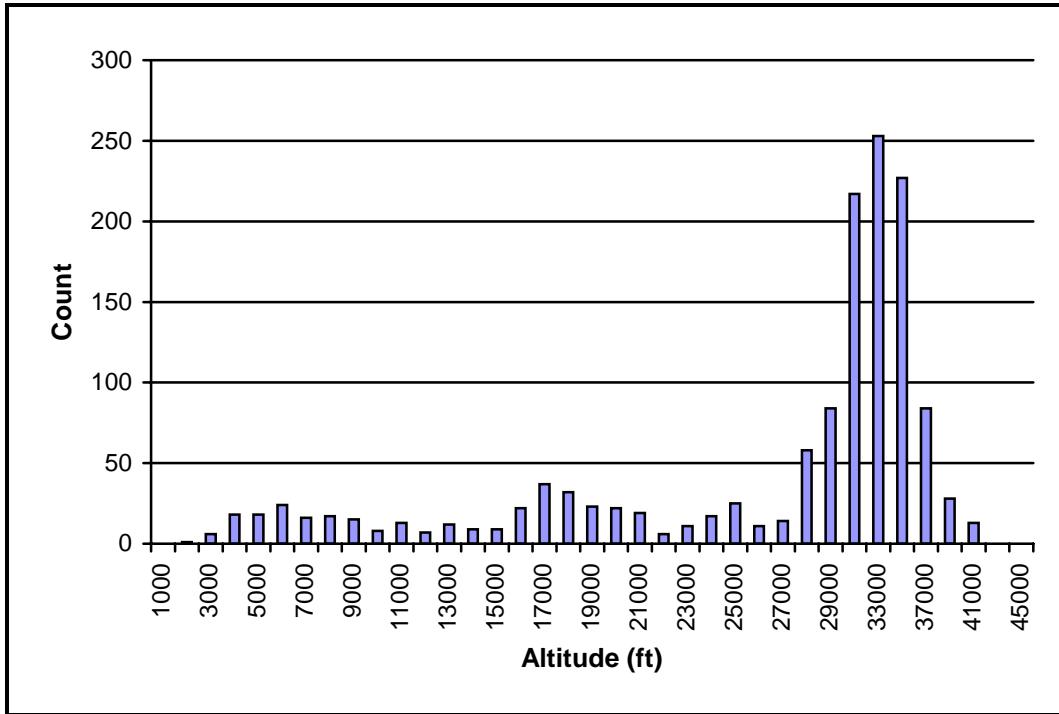


Figure 1: Aircraft to Aircraft Encounters by Altitude

4.3 Count Partitioned by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.1.3 of Reference[1].

Table 3: Count of Aircraft Encounters Partitioned by Phase of Flight and Encounter Angle

Vertical Phase	Encounter Angles (deg)				Total
	[0, 45)	[45, 90)	[90, 135)	[135, 180]	
Cruise-Cruise	118	105	64	30	317
Descend-Descend	33	13	7	8	61
Climb-Climb	43	11	9	11	74
Cruise-Climb	131	80	77	101	389
Cruise-Descend	128	103	81	99	411
Climb-Descend	35	15	22	38	110
Unknown	9	1	2	2	14
Total	497	328	262	289	1376

5 Airspace Encounter Distributions

This section provides statistics on aircraft to airspace encounters. Three areas considered are counts partitioned by selected minimum horizontal separation intervals, an encounter count partitioned by standard flight levels, and a count partitioned by vertical phase of flight and airspace encounter angle. Additionally, vertical phase of flight count is separated into top, bottom and side airspace encounters and for encounters with unknown encounter angles. The section corresponds to Section 3.2.2 of Reference[1].

5.1 Count Partitioned by Minimum Horizontal Separation

The section corresponds to Section 3.2.2.1 of Reference[1].

Table 4: Count of Current Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	13 minutes Adherence
Conflicts ¹	2169	1869
$d = 0^2$	36	29
$0 < d < 7$	778	617
$7 \leq d < 9$	219	167
$9 \leq d < 11$	172	140
$11 \leq d < 16$	507	400
$16 \leq d < 30$	1773	1389
Total	5654	4611

Table 5: Count of Trial Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
Conflicts ³	2169	1832
$d = 0^4$	36	29
$0 < d < 8$	893	693
$8 \leq d < 11$	276	215
$11 \leq d < 13$	179	137
$13 \leq d < 19$	705	552
$19 \leq d < 30$	1396	1073
Total	5654	4531

¹ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

² This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

³ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

⁴ This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

5.2 Count Partitioned by Altitude

This section corresponds to Section 3.2.2.2 of Reference[1].

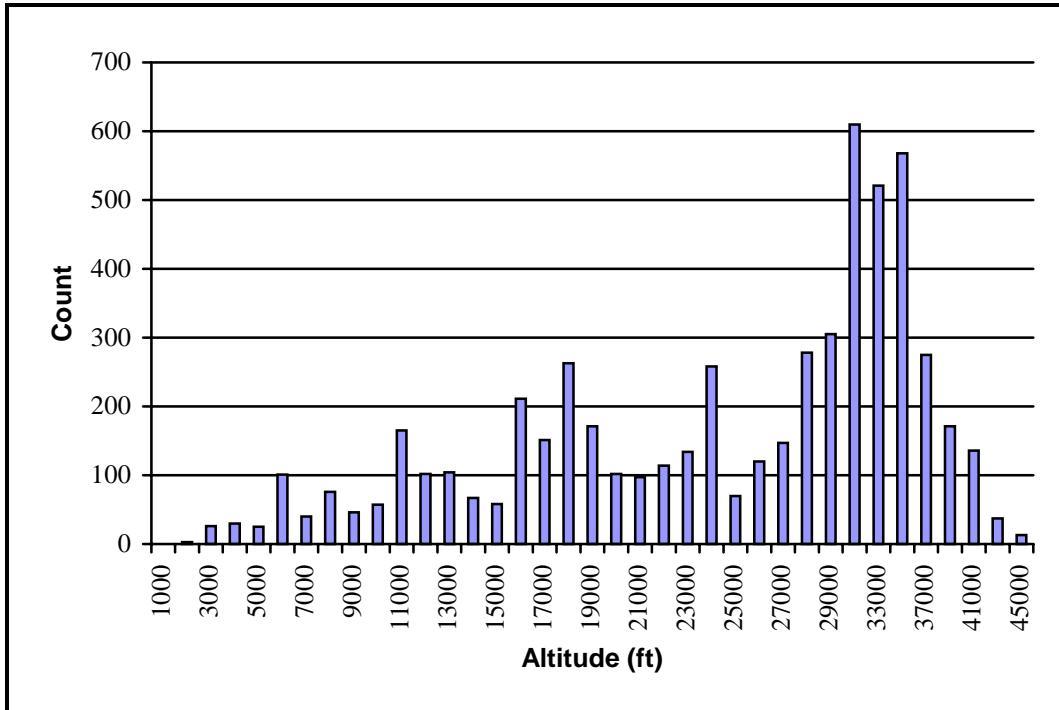


Figure 2: Airspace to Airspace Encounters by Altitude

5.3 Count by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.2.3 in Reference[1].

Table 6: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Side Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	17	70	106	193
Cruise	113	572	689	1374
Descend	20	55	63	138
Total	150	697	858	1705

Table 7: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Top and Bottom Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	169	0	0	169
Cruise	0	0	0	0
Descend	18	0	0	18
Total	187	0	0	187

Table 8: Count of Airspace Encounters by Vertical Phase of Flight with Unknown Angles

Vertical Phase	Count
Climb	56
Cruise	186
Descend	35
Total	277

6 Air Traffic Distributions

This section provides metrics that characterize the air traffic. The metrics are flight density partitioned by standard flight levels, flight type and sector penetration, statistics on the number of active flights, ground speed statistics, counts of interim altitude and amendment messages, and air traffic maneuvers by altitude and phase of flight. This section corresponds to Section 3.3 of Reference[1].

6.1 Air Traffic Density

This section corresponds to section 3.3.1 of Reference[1]. Detailed statistics on aircraft encounters are provided in Appendix A.

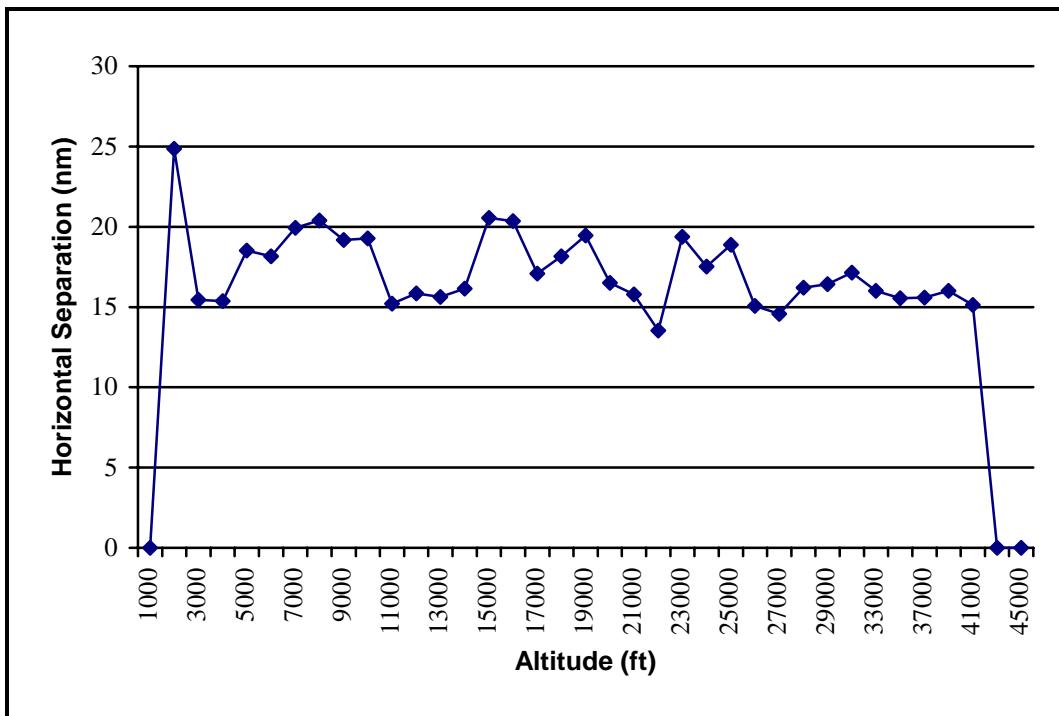


Figure 3: Average Horizontal Separation by Altitude for All Hours

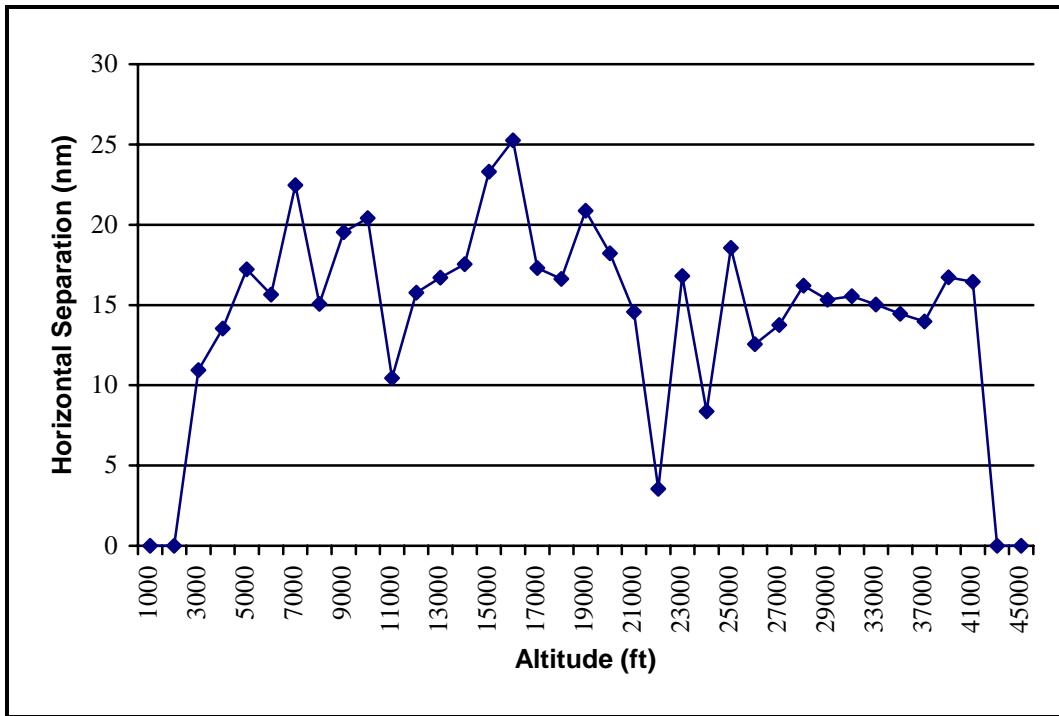


Figure 4: Average Horizontal Separation by Altitude for Hour 1

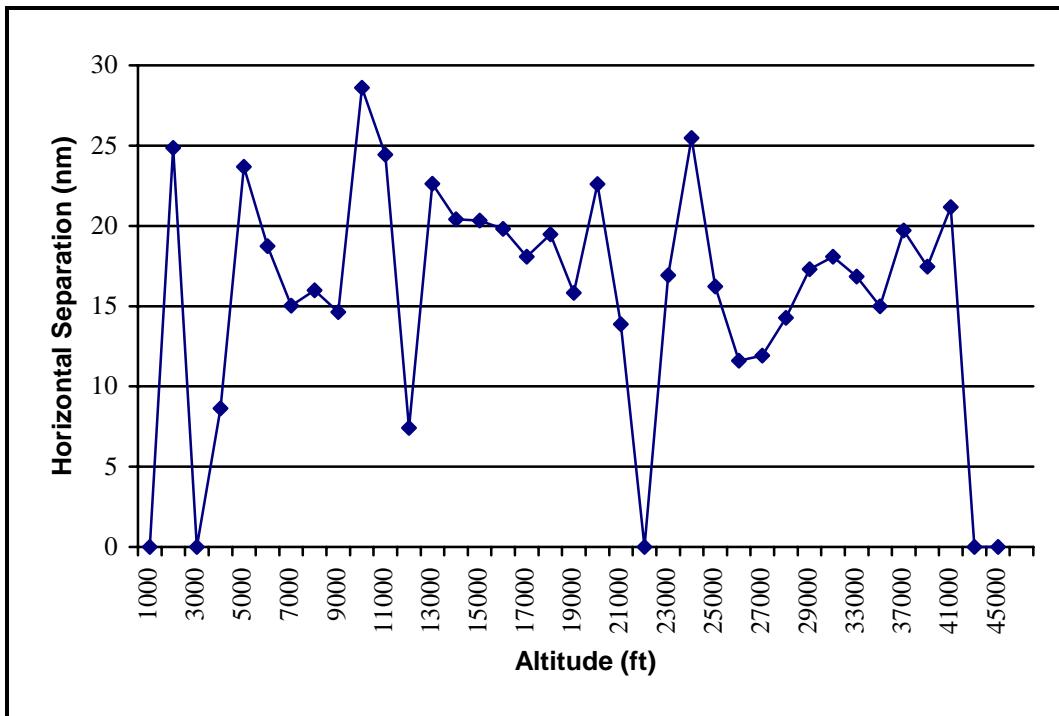


Figure 5: Average Horizontal Separation by Altitude for Hour 2

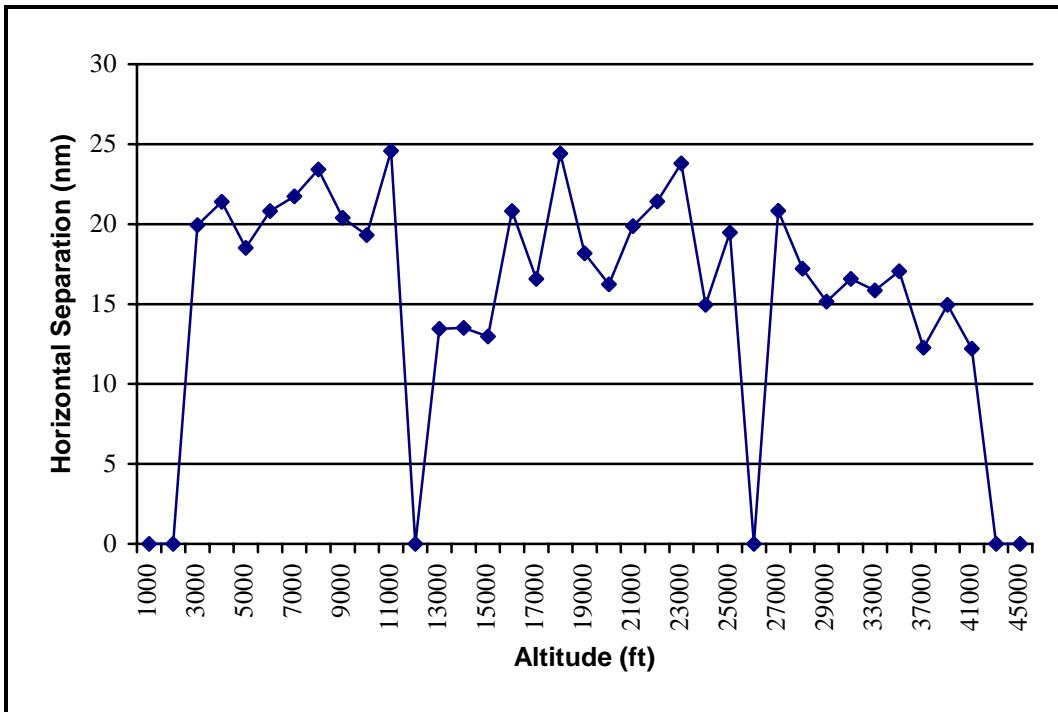


Figure 6: Average Horizontal Separation by Altitude for Hour 3

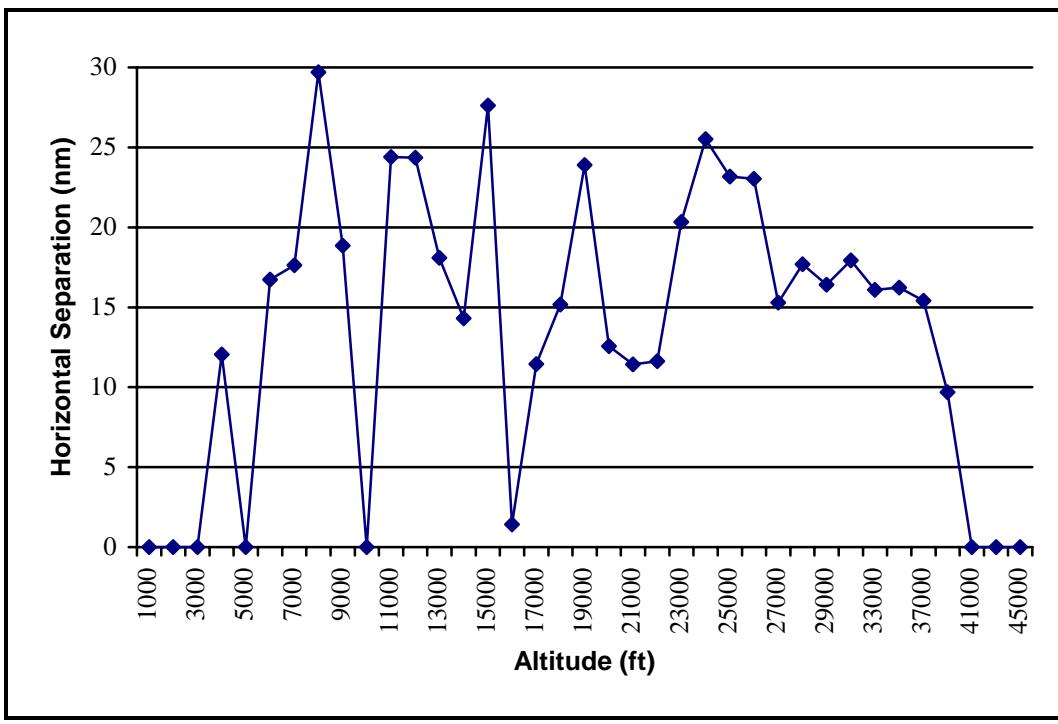


Figure 7: Average Horizontal Separation by Altitude for Hour 4

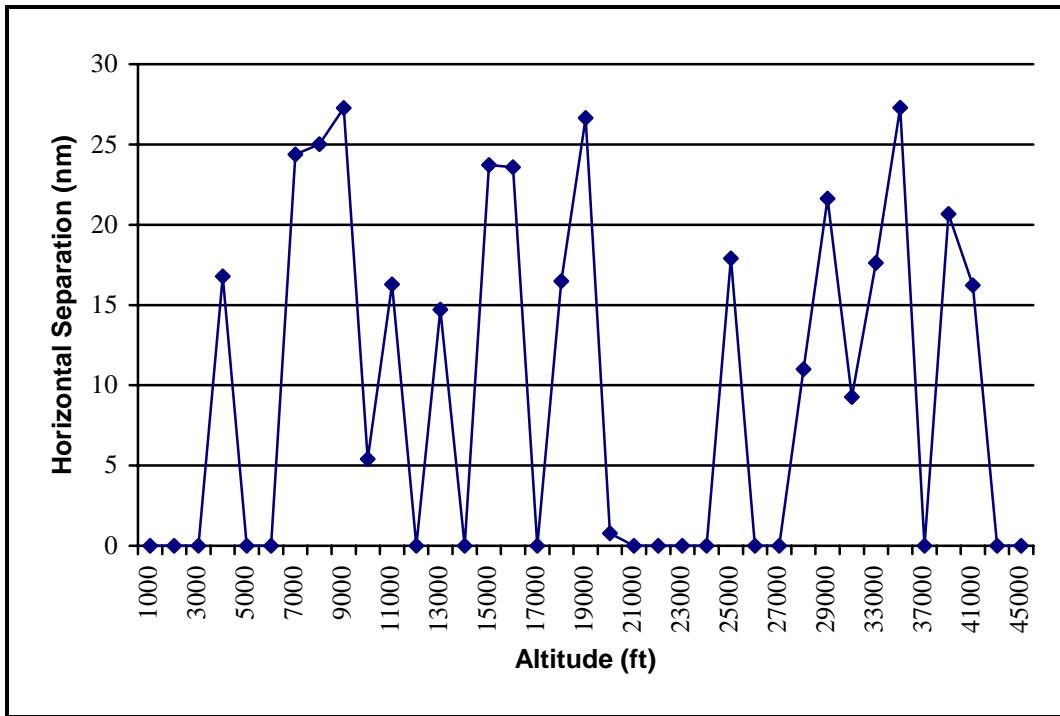


Figure 8: Average Horizontal Separation by Altitude for Hour 5

Appendix A: Supplement to Section 6.1 - Aircraft Traffic Density

Table 9: Statistics on Aircraft Encounters by Altitude Interval for All Hours

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	1	24.860	0.000
3000	6	15.446	8.565
4000	18	15.364	8.818
5000	18	18.517	6.227
6000	24	18.154	8.014
7000	16	19.941	7.561
8000	17	20.398	8.015
9000	15	19.176	8.136
10000	8	19.284	8.125
11000	13	15.202	9.075
12000	7	15.843	8.410
13000	12	15.622	6.826
14000	9	16.155	5.528
15000	9	20.542	6.879
16000	22	20.353	7.450
17000	37	17.081	8.079
18000	32	18.161	8.147
19000	23	19.456	7.416
20000	22	16.512	7.421
21000	19	15.794	7.920
22000	6	13.542	7.392
23000	11	19.372	4.673
24000	17	17.516	9.838
25000	25	18.879	7.941
26000	11	15.067	8.965
27000	14	14.574	8.196
28000	58	16.210	7.773
29000	84	16.423	8.527
31000	217	17.136	7.978
33000	253	16.010	8.194
35000	227	15.539	8.061
37000	84	15.595	8.116
39000	28	16.016	7.835
41000	13	15.139	9.432
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	1376		

Table 10: Statistics on Aircraft Encounters by Altitude for Hour 1

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	3	10.952	8.939
4000	6	13.536	10.683
5000	8	17.228	7.231
6000	4	15.655	5.448
7000	5	22.471	5.113
8000	5	15.079	9.703
9000	5	19.527	8.278
10000	4	20.412	5.488
11000	8	10.440	7.891
12000	3	15.776	8.096
13000	3	16.706	10.075
14000	4	17.540	6.543
15000	2	23.294	1.981
16000	2	25.251	0.189
17000	9	17.296	9.649
18000	8	16.629	8.292
19000	10	20.875	7.270
20000	10	18.216	6.328
21000	6	14.577	7.800
22000	1	3.548	0.000
23000	4	16.808	3.405
24000	3	8.371	13.392
25000	9	18.566	8.806
26000	4	12.567	9.685
27000	5	13.757	5.951
28000	13	16.213	9.391
29000	8	15.337	9.073
31000	20	15.541	7.842
33000	66	15.038	7.865
35000	63	14.444	8.503
37000	17	13.968	7.500
39000	7	16.724	8.915
41000	5	16.439	11.317
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	330		

Table 11: Statistics on Aircraft Encounters by Altitude for Hour 2

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	1	24.860	0.000
3000	0	0.000	0.000
4000	3	8.639	9.498
5000	2	23.677	3.804
6000	9	18.731	7.513
7000	5	15.025	9.103
8000	3	15.989	5.290
9000	4	14.634	9.193
10000	1	28.611	0.000
11000	2	24.435	5.217
12000	2	7.424	2.514
13000	1	22.615	0.000
14000	1	20.419	0.000
15000	3	20.341	6.444
16000	8	19.820	8.044
17000	15	18.077	8.409
18000	10	19.472	8.650
19000	5	15.827	9.476
20000	2	22.596	3.527
21000	2	13.870	13.429
22000	0	0.000	0.000
23000	2	16.917	4.281
24000	3	25.483	3.594
25000	5	16.229	9.403
26000	4	11.597	7.749
27000	4	11.925	11.290
28000	12	14.264	7.088
29000	27	17.295	8.010
31000	87	18.089	7.973
33000	73	16.845	8.573
35000	83	14.990	7.667
37000	29	19.710	6.404
39000	11	17.454	9.076
41000	1	21.170	0.000
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	420		

Table 12: Statistics on Aircraft Encounters by Altitude for Hour 3

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	3	19.941	6.547
4000	5	21.404	6.400
5000	8	18.517	5.504
6000	5	20.811	10.053
7000	3	21.734	9.905
8000	4	23.406	6.533
9000	1	20.387	0.000
10000	2	19.307	9.322
11000	1	24.568	0.000
12000	0	0.000	0.000
13000	5	13.440	5.217
14000	3	13.503	5.731
15000	2	12.974	10.087
16000	8	20.818	5.036
17000	11	16.573	5.370
18000	4	24.421	4.575
19000	6	18.175	6.446
20000	6	16.239	7.323
21000	7	19.879	7.499
22000	2	21.423	4.674
23000	3	23.788	5.635
24000	8	14.956	8.120
25000	7	19.472	8.500
26000	0	0.000	0.000
27000	2	20.836	10.956
28000	25	17.205	7.743
29000	28	15.160	8.827
31000	82	16.562	8.025
33000	69	15.852	7.806
35000	58	17.048	7.977
37000	27	12.276	8.470
39000	6	14.942	5.448
41000	5	12.199	10.686
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	406		

Table 13: Statistics on Aircraft Encounters by Altitude for Hour 4

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	1	12.048	0.000
5000	0	0.000	0.000
6000	6	16.741	9.562
7000	1	17.627	0.000
8000	1	29.705	0.000
9000	3	18.845	9.542
10000	0	0.000	0.000
11000	1	24.388	0.000
12000	2	24.363	0.078
13000	1	18.100	0.000
14000	1	14.310	0.000
15000	1	27.609	0.000
16000	1	1.421	0.000
17000	2	11.438	15.645
18000	7	15.178	8.814
19000	1	23.893	0.000
20000	3	12.563	7.669
21000	4	11.432	5.715
22000	3	11.618	2.840
23000	2	20.331	1.757
24000	3	25.518	2.885
25000	3	23.181	2.352
26000	3	23.026	6.285
27000	3	15.295	7.672
28000	6	17.685	6.534
29000	17	16.404	8.957
31000	25	17.924	7.529
33000	38	16.087	8.119
35000	22	16.235	8.091
37000	11	15.410	8.484
39000	3	9.687	4.086
41000	0	0.000	0.000
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	175		

Table 14: Statistics on Aircraft Encounters by Altitude for Hour 5

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	3	16.781	5.095
5000	0	0.000	0.000
6000	0	0.000	0.000
7000	2	24.370	4.258
8000	4	25.019	4.447
9000	2	27.275	0.922
10000	1	5.400	0.000
11000	1	16.279	0.000
12000	0	0.000	0.000
13000	2	14.716	10.797
14000	0	0.000	0.000
15000	1	23.713	0.000
16000	3	23.576	6.831
17000	0	0.000	0.000
18000	3	16.491	7.445
19000	1	26.647	0.000
20000	1	0.777	0.000
21000	0	0.000	0.000
22000	0	0.000	0.000
23000	0	0.000	0.000
24000	0	0.000	0.000
25000	1	17.904	0.000
26000	0	0.000	0.000
27000	0	0.000	0.000
28000	2	10.996	6.555
29000	4	21.635	8.550
31000	3	9.277	9.453
33000	7	17.620	12.171
35000	1	27.299	0.000
37000	0	0.000	0.000
39000	1	20.666	0.000
41000	2	16.221	2.850
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	45		